(19) Patent office of Japan (JP) (11) Publication of Patent Application

(12) **JAPANESE PATENT APPLICATION (KOKKAI) (A)**
Hei-Sei 7-62154

(51) Int. CL.5	ID Code	Office Cont'l Nbr.	(43) Publication: Hei-Sei 7 (1995) 3/7
C 08 L 9/06	LBG		
A 61 L 15/58			
C 08 J 5/18	CET	9267-4F	
C 08 L 23/00	LCB		
A 61 L 15/06			

Verification Request: not requested

Number of claims of the invention: 2 OL

Number of pages (5)

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(54) Name of the invention: Flexible Film

(21) Filed Number: Hei-Sei 5-207375

(22) Filed date: Hei-Sei 5 (1993) 8/23

Patent Assignee: Nichiban Company

JP 7-62154

[Note : Names, addresses, Company names and brand names are translated in the most common manner. Japanese Language does not have singular or plural words unless otherwise specified with numeral prefix or general form of plurality suffix. Translator's note.]

(54) [Name of the invention]

Flexible Film

(57) [Summary]

[Structure]

Flexible (elastic) film, that is formed from a composition containing in the range of 25 ~ 75 weight % of hydrogenated material, of a copolymer formed from styrene, in an amount in the range of 5 ~ 50 weight % and diene type hydrocarbon, in an amount in the range of 95 ~ 50 weight %; and containing polyolefin in an amount in the range of 75 ~ 25 weight %.

[Result]

Because it is flexible, the film has appropriate elongation and strength, and especially it has excellent stress relaxation properties, and also at the time of the incineration, there is no generation of toxic gas, like hydrochloride type gas, etc.

[Range of the claims of the invention]

[Claim 1]

Flexible film, that is formed from a composition containing in the range of 25 ~ 75 weight % of hydrogenated material, of a copolymer formed from styrene, in an amount in the range of 5 ~ 50 weight % and diene type hydrocarbon, in an amount in the range of 95 ~ 50 weight %; and containing polyolefin in an amount in the range of 75 ~ 25 weight %.

[Claim 2]

Film according to the above described Claim 1 of the present invention, characterized by the fact that the stress relaxation coefficient in the longitudinal direction is 30 % or more, and the degree of flexibility is 2 or more, and that the stress relaxation coefficient in the transverse direction is 35 % or more, and the flexibility degree is 2 or more.

[Detailed explanation of the invention]

[0001]

[Technological sphere of application]

The present invention is an invention about a flexible film, and especially, it is an invention about a film that is used in adhesive plaster in order to be adhered to the affected area or to be fixed on the skin of the patent, and especially, it is about a film used in first aid (emergency) adhesive plaster material.

[0002]

[Previous technology]

In the past, as films, such as the films used in adhesive plaster materials, where flexible properties are required, the materials have been used where on flexible polyvinyl chloride, polyolefin type, etc., plastic substrate material films, an adhesive agent has been coated. And especially, the soft polyvinyl chloride films have been widely used. However, in the soft polyvinyl chloride film, a large amount of plasticising agent is contained, and because of that, by its exuding, a decrease of the adhesive strength is generated, and due to that, a treatment by an anchor coating agent is necessary. Also, in the case of the polyvinyl chloride, at the time of the incineration a toxic hydrochloride gas is generated, and because of that, there is the trend that worldwide its use is controlled and limited.

[0003]

Contrary to that, the polyethylene or polypropylene, etc., polyolefin type films, or the films, that have been disclosed according to the description reported in the Japanese Patent Report Number Hei-Sei 5-27424, that are obtained from olefin type and diene type elastomers, have been considered as substitution materials for the polyvinyl chloride. However, there is no balance obtained of the elastic properties, the elongation and the stress relaxation properties, and compared to the adhesive plaster materials using polyvinyl chloride substrate material, there is the problem that at the time of

the adhesion onto the affected area, there is a feeling of compression and a sense of incompatibility. Namely, in the case of the film according to the previous technology, that has been obtained from an olefin type material and a diene type elastomer, the flexible properties and the stress relaxation properties become mutually opposing properties, and there is the problem that if the ratio of the elastomer material is increased, the flexibility properties are increased, however, the stress relaxation properties are decreased; and if the ratio of the elastomer material is decreased, the stress relaxation properties are increased, however, the flexibility properties are decreased.

[0004]

[Problems solved by the present invention]

Regarding the present invention, it is an invention that has as a goal to solve the above described problems and it has as a goal to suggest a flexible film where the anchor coating agent treatment in order to eliminate the transfer of the plasticising agent is not necessary, and there is no generation of toxic gas at the time of the incineration, and it has appropriate stress relaxation properties, degree of flexibility and tensile strength.

[0005]

[Measures in order to solve the problems]

The present invention is about a flexible (elastic) film, that is formed from a composition containing in the range of 25 ~ 75 weight % of hydrogenated material, of a copolymer formed from styrene, in an amount in the range of 5 ~ 50 weight % and diene type hydrocarbon, in an amount in the range of 95 ~ 50 weight %; and containing polyolefin in an amount in the range of 75 ~ 25 weight %. As he diene type hydrocarbon, it is possible to use isoprene, butadiene, etc.

[0006]

Regarding the flexible film material according to the present invention, it is characterized by the fact that because of the fact that in the structural component materials, a styrene skeleton is contained, even if a plasticising agent is not added, flexible properties are obtained and at the same time, also, stress relaxation properties are imparted. Regarding the hydrogenated material obtained from the styrene and diene type hydrocarbon copolymer material, the materials where the contained amount of styrene is in the range of 5 ~ 50 weight %, and the melt flow rate (MFR) as measured according to ASTM D1238; at a temperature of 230oC and 2.16 kg, is in the range of 2 ~ 10 g/10 minutes, are preferred. In the case when the contained amount of styrene is less than 5 weight %, the stress relaxation properties are decreased,

and in the case when the contained amount of styrene exceeds 50 weight %, there is the trend that the flexibility properties are decreased. In the case of films where the flexibility properties are especially required, such as the bandages used in medical treatment, the films used in adhesive plaster materials, the films used in emergency adhesive plaster materials, it is preferred that the copolymer material obtained from styrene and diene type hydrocarbon, is a random type copolymer material that has flexibility properties.

[0007]

As the polyolefin materials, there are polypropylene, polyethylene, copolymer obtained from ethylene and alpha-olefin, and it is also possible to use ionomer resins where in the continuous chain of a polymer material that has its main component a high alpha- olefin resin, ethylene, there is a metal ion bond, a copolymer obtained from ethylene and methylmethacrylate, etc. And it is preferred to use materials where the MFR as measured according to ASTM D1238; at a temperature of 230oC and 2.16 kg, is in the range of 2 ~ 60 g/10 minutes, and as measured according to ASTM D1238; at a temperature of 190oC and 2.16 kg, it is in the range of 0.1 ~ 20 g/10 minutes.

[0008]

Among the film compositions, in the case when the hydrogenated material obtained from the styrene and diene copolymer material, is less than 25 weight %, and in the case when the amount of the polyolefin exceeds 75 weight %, it becomes a film, where the degree of flexibility is decreased, and at the time when t is adhered onto the skin, the sense of incompatibility becomes high. On the other hand, in the case when the hydrogenated material obtained from the styrene and diene copolymer material, exceeds 75 weight %, or in the case when the amount of the polyolefin is less than 25 weight %, the stress relaxation properties are decreased, and after the gluing the compression onto the affected part becomes large, and t is not appropriate for use as a film substrate material used in adhesive plaster materials.

[0009]

The film according to the present invention can be manufactured as the above described hydrogenated material obtained from the styrene and diene copolymer material and the polyolefin material are melted and mixed, and after that a film is manufactured. Regarding the film manufacturing method, it is possible to use the inflation manufacturing method, the T die method, etc., well known methods. regarding the film thickness, it can be appropriately selected depending on the required degree of elongation, the degree of flexibility properties, etc., however, usually, it is in the range of 30 ~ 200 microns.

[0010]

Regarding the film according to the present invention, it is also a good option if in order to improve the processing of the manufactured film or to improve the printing feasibility properties after the manufacturing of the layer, a corona electrical discharge treatment is conducted, or if in order to improve the gas permeability properties, a processing providing open porosity, and especially, a surface embossing technological process, etc., is conducted. Also, at the time when it is used in adhesive plaster materials, it is also possible to use a material where on the back surface an adhesive agent is coated, and it is glued onto gauze, release paper, etc., film materials. Here below, the present invention will be explained in more details by using practical implementation examples.

[0012]

[Practical Examples]

Practical Examples 1 ~ 7

Hydrogenated material obtained from the styrene and diene copolymer material, polyolefin, slip agent, are compounded at the ratios that are shown according to the presented here below Table 1, and these are melted and mixed at a temperature in the range of 180 ~ 220oC, and after that, at a temperature in the range of 200 ~ 230oC, by using a T die a film material is manufactured, and by that a film with a thickness of 90 microns, is manufactured. In each the longitudinal direction and the transverse direction of the film, the degree of flexibility, the stress relaxation coefficient, the tensile strength, the elongation, the elastic modulus, were measured. And the results from these measurements are shown in the presented here below Table 2.

[0013]

Degree of flexibility

A test material that has an initial length of 50 mm and a width of 18 mm, is extended at an extension rate of 200 mm/minute, and it is represented by a value obtained from dividing the 50 % modulus to the 5 % modulus, at that time.

Stress relaxation coefficient

It is the proportion of the stress after 1 minute relaxation normalized by the initial stress at the time when a test material that has an initial length of 50

mm and a width of 18 mm, is extended at an extension rate of 200 mm/minute, and it is elongated to a 50 % increase of the length.

Tensile strength

The stress at break at the time when a test material that has an initial length of 50 mm and a width of 10 mm, is extended at an extension rate of 300 mm/minute,

Elongation

The elongation until the point of break at the time when a test material that has an initial length of 50 mm and a width of 10 mm, is extended at an extension rate of 300 mm/minute.

Tensile modulus

It is the initial tensile coefficient at the time when a test material that has an initial length of 50 mm and a width of 10 mm, is extended at an extension rate of 300 mm/minute.

[0014]

Reference Examples 1 ~ 5

Hydrogenated material obtained from the styrene and diene copolymer material, polyolefin, slip agent, are compounded at the ratios that are shown according to the presented here below Table 1, and these are melted and mixed at a temperature in the range of 180 ~ 220oC, and after that, at a temperature in the range of 200 ~ 230oC, by using a T die a film material is manufactured, and by that a film with a thickness of 90 microns, is manufactured. In each the longitudinal direction and the transverse direction of the film, the degree of flexibility, the stress relaxation coefficient, the tensile strength, the elongation, the elastic modulus, were measured the same way as in he case of the Practical Examples 1 ~ 7. And the results from the measurements of the degree of flexibility, the stress relaxation coefficient, the tensile strength, the elongation, the elastic modulus, are shown in the presented here below Table 2.

[0015]

[Table 1]

表1

	水添スチレンブタジエンコポリマー(重量%)		ポリオレフィン(重量%)					滑剤(重量%)
	スチレン含量		ポリプロピレン	エチレンオクテン系ハイα-オレフィン	エチレンメチルメタクリレートコポリマー	エチレン系アイオノマー	エチレンプロピレンジエンコポリマー	タルク
	10%	30%						
実施例1	30	-	43	27	-	-	-	-
〃 2	40	-	40	-	-	20	-	-
〃 3	45	-	41	14	-	-	-	-
〃 4	48	-	38	-	14	-	-	-
〃 5	49	-	49	-	-	-	-	2
〃 6	40	10	35	-	15	-	-	-
〃 7	58	-	42	-	-	-	-	-
比較例1	20	-	48	32	-	-	-	-
〃 2	80	-	10	10	-	-	-	-
〃 3	-	-	-	-	50	-	50	-
〃 4	-	-	-	-	60	-	40	-
〃 5	-	-	-	-	100	-	-	-

Headings for the table:
1. Practical Examples, 2. Reference Examples, 3. Hydrogenated material obtained from the styrene and diene copolymer material, (weight %), 4. polyolefin, (weight %), 5. slip agent, (weight %), 6. contained amount of styrene, 7. polypropylene, 8. ethylene octene type, high alpha - olefin, 9. ethylene methylmethacrylate copolymer, 10. ethylene type ionomer, 11. ethylene propylene diene copolymer, 12. talc.

styrene butadiene random copolymer - (styrene content, 10 %) - Dinalon 1320 P (MFR1 3.5 g/10 min), manufactured by Nippon Gosei Rubber Company

styrene butadiene random copolymer - (styrene content, 30 %) - Dinalon 1910 P (MFR1 5.3 g/10 min), manufactured by Nippon Gosei Rubber Company

polypropylene - Shutsuko polypropylene F-700 N (MFR1, 7.5 g/10 min) manufactured by Shutsuko Petro-Chemical Company

ethylene - octene type high alpha - olefin - Moatek V-0398 CN (MFR2 3.0 g/10 min) manufactured by Shutsuko Petro-Chemical Company

ethylene - methylmethacrylate copolymer - Akurifto WD 201 (MFR2, 2.0 g/10 min) manufactured by Sumitomo Chemical Company

ethylene type ionomer - Himiran 1605 (MFR2 2.8 g/10 min), manufactured by Mitsui Dupont Poly Chemical Company

ethylene propylene diene copolymer - Mirastomer M4800 N (MFR1, 25.0 g/10 min) manufactured by Mitsui Dupont Poly Chemical Company

talc - Microes, manufactured by Fuji Talc company

Remark) MFR1 (ASTM D1238; 230oC, 2. 16 kg), MFR 2 (ASTM D1238; 190oC, 2. 16 kg).

[0016]

[Table 2]

(Shown on a separate page.)

Headings for the table:
1. Practical Example, 2. Reference Example, 3. direction, 4. longitudinal, 5. transverse, 6. degree of flexibility, 7. stress relaxation coefficient (%), 8. tensile strength. 9. elongation, 10. elastic modulus.

[0017]

As it is clear from the Practical Examples 1 ~ 7, in the case of a film material that is formed from in the range of 25 ~ 75 weight % of a hydrogenated material of a random copolymer obtained from styrene and diene elastomer, and from in the range of 75 ~ 25 weight % of polyolefin, it is a material that is flexible and that shows appropriate elongation and tensile strength, and especially, that also has excellent stress relaxation properties. Also, in the case, as shown according the materials of the Reference Examples 1 ~ 2, where the hydrogenated material of a random copolymer obtained from styrene and diene elastomer, and from in the range of 75 ~ 25 weight % of polyolefin is contained in an amount that is either less than 25 % or more than 75 weight %, and also in the case of the materials according to the Reference Examples 3 ~ %, where a hydrogenated material of a random copolymer obtained from styrene and diene elastomer, and from in the range of 75 ~ 25 weight % of polyolefin, has not been used, and in the case of films obtained from olefin type material and diene type elastomer, a balance between the flexibility degree and the stress relaxation properties, is not obtained, and it is not appropriate to be used as a flexible film material.

[0018]

[Results from the present invention]

The film material according to the present invention is a film that is flexible and that has appropriate elongation and tensile strength properties, and

especially, it also has excellent stress relaxation properties, and it is appropriate as a flexible film material.

Patent Assignee: Nichiban Company

【0016】

表2

	3 方向	柔軟度	応力緩和率 (%)	引張強度 (kg/mm²)	伸び (%)	弾性率 (kg/mm²)
実施例1	縦	2.1	38	4.0	980	4
	横	2.2	39	3.1	910	4
〃 2	縦	2.3	47	2.8	790	5
	横	2.6	47	2.9	800	4
〃 3	縦	2.8	37	2.7	1000	1
	横	2.7	36	2.9	940	1
〃 4	縦	2.7	44	3.0	1030	3
	横	2.7	44	2.6	970	3
〃 5	縦	2.8	48	2.6	710	4
	横	2.5	47	2.8	870	4
〃 6	縦	2.3	40	2.0	780	2
	横	3.5	40	2.2	950	2
〃 7	縦	3.4	44	2.3	820	2
	横	3.3	43	2.9	960	2
比較例1	縦	1.6	43	3.8	800	12
	横	1.5	42	3.0	840	13
〃 2	縦	5.2	23	0.9	1080	0.1
	横	6.0	23	0.8	1240	0.1
〃 3	縦	1.7	37	1.9	500	13
	横	1.5	34	2.0	620	13
〃 4	縦	1.8	35	2.6	630	12
	横	1.6	33	2.5	730	14
〃 5	縦	2.3	29	1.4	740	2
	横	2.1	30	1.3	820	2